



MINISTERIO DE INDUSTRIA Y ENERGIA  
JUNTA DE ENERGIA NUCLEAR

Madrid, 20th February 1981

Dr. Bruce Wachholz  
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WASHINGTON D.C. 20.545.

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Dear Dr. Wachholz:

I have pleasure of sending to you the supplementary report submitted for continuing assistance for the fiscal year (October 1.980 to September 30, 1981) corresponding to the two years period starting on the 1st October 1979.

Would you send me please any comment you have about this report?

I have not received so far the letter from Dr. Richmond related to the Plutonium report to be published by N.E.A. It is very surprising why the letters from Chet do not arrive . I will telephone him if the letter does not arrive soon.

Best regards

Sincerely yours

- Emilio Iranzo-

Jefe de la División de Protección y Medicina



MINISTERIO DE INDUSTRIA Y ENERGIA  
JUNTA DE ENERGIA NUCLEAR

TITLE: INDALO PROJECT. Following of the accident at Palomares from 1966. Period: 1st October 1980 to 30th September 1.981.

This report is a submission for continuing assistance for the fiscal year (October 1, 1980 to September 30, 1981) and supplements that sent in 1980 to cover the two years period (October 1, 1979 to September 30, 1981).

1. EXPERIMENTAL WORK DONE IN THE PERIOD 1st October 1979-30th September 1980 .

1.1. A I R

Air samples have been taken daily in both station S-2 (area 2 ) and station P (village center of Palomares ). Sampling time has been twenty four hours. Seven hundred samples have been taken during the period.

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Seven hundred and ten samples belonging to 1979 - have been analyzed by alpha spectrometry for Pu-239. The analysis are made in ten-day groups. Most of the results corresponding to 1979 showed values which are below the detection limit,  $5 \times 10^{-17} \mu\text{Ci/cm}^3$  . In the station 2-2 the 30.6 per cent of the results were over the detection limit; the highest value,  $2,46 \times 10^{-15}$  -

$\mu\text{Ci}/\text{cm}^3$  , has been found in the middle of May. In station P, the 11.1 per cent of the results are over the detection limit; the highest value,  $1.67 \times 10^{-15} \mu\text{Ci}/\text{cm}^3$ , was found in the middle of July.

Individual internal doses to the population of Palomares have been calculated from the inhalation exposure to Pu-239 during the period 1966-1978. For the calculations, population has been broken down into babies, children , youngs and adults persons.

#### 1.2. S O I L S

No soil samples have been taken in 1980.

Four hundred and seventy four (474) soil samples have been processed and counted by alpha - spectrometry for Pu-239. The samples counted belonged to those taken in areas 2-1, 2-2, 3-1, - 3-2, 5-1 and 5-2 during 1976 and in areas 5-3B,- 3-1, 2-0 during 1979 and the surface soil samples in all areas during 1979, too

#### **DOE ARCHIVES**

The new SOIL ANALYSIS SYSTEM, made by Los Alamos Scientific Laboratory, which includes intrinsic Germanium detectors has been put in operation during the period September-November. From direct counting of one hundred and five (105) soil samples done so far, we have realized the system responds very well for Americium-241, but no so well

for Plutonium-239, particularly if the concentration of the latter is lower than 60 pCi/g. which is frequently.

The results obtained in the samples counted have - shown we will obtain interesting results on the behavior of americium-241 in the environment counting - stored samples of soil and vegetation corresponding - to the period 1966-1980.

In September we received the new FIDLER instruments for area survey. Due to sickness of the person in - charge of the survey of the hills zone (zone 2) we - could not do it during the last quarter of 1980. It - will be started during the first quarter of 1981.

### 1.3.-VEGETATION

One hundred and sixty six (166) vegetation samples have been taken. Some are of wild vegetation and most of it are representative of all the crops cultivated in the zone of Palomares during 1980.

#### **DOE ARCHIVES**

The samples taken belong to tomatoes (fruit and leaves) barley (grain and straw), alfalfa, maize (corn and plant) melón (fruit and plant), fig tree (fruit and leaves) - lemons (fruit and leaves), oranges (fruit) grenades - (fruit and leaves), carob (fruit and leaves), prickly pears (fruit and leaves), american aloe leaves, vineyards (fruit and leaves) and grazing grass.

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The wild vegetation samples belong to passerina, spartus and sisca.

Two hundred and thirty three(233) vegetation - samples taken during 1979 and 1980 were treated to - ashes. All the fruits were peeled off and processed both parts by separate. One hundred and forty (140) samples were processed and counted by alpha spectro- metry . These counted samples were taken during 1978, sixty six, and 1979, seventy four.

The samples analysis are always made by dupplica- ted.

#### 1.4.- A N I M A L S

Twenty samples of snails living in zones 2, 3 and 5 have been , during this period, processed and counted by alpha spectrometry for plutonium-239 .Samples were taken in 1979.

One goat that has been grazing around the zone of - Palomares for several years has been killed; a big per- centage of its grazing was in area 2, in the hills. - Samples from lung, limphatic nodes, trachea, spleen, kid- ney , liver, stomach, intestine, ovary, bones and mus- cles have been processed and counted by alpha spectrome- try.

#### **DOE ARCHIVES**

It took some time to put in operation the method for - procesing animal samples. Now is ready and has been - applied to those samples.

## 2.- EXPERIMENTAL FUTURE WORK FOR 1981

### 2.1.- A I R

Daily air samples will be taken in stations 2-2 and P.

One new air sampling station will be put in operation in the area 2, somewhere the station 2-1 was located. The place for this location will be selected after the area survey with the FIDLER equipment. As soon as it is in operation daily samples will be taken.

We hope that new equipment for air sampling stations will arrive this year.

1980 air samples will be counted for americium-241 with the intrinsic Germanium detector system. Then, they will be processed and counted by alpha - spectrometry for plutonium-239.

Seventy two (72) is the number of samples to be counted and processed, because we prepare each processed sample with the air samples of ten days.

**DOE ARCHIVES**

### 2.2- S O I L S

The survey of the zone in the hill (zone 2) will be made with the new FIDLER instruments which are in operation.

Surface soil samples will be taken from areas 5-3B , 2-0, 2-1, 2-2, 2-2N, 3-1, 3-2, 5-1 and 5-2. Also they will be taken from new areas if the area survey made us to think about its necessity.

Soil samples will be counted directly with the - "Soil Analysis System" for americium-241, plutonium-239 and uranium-235. We hope to count about 700 soil samples until the 1st of October 1981. These samples will belong to those taken in 1966 and 1979.

Two hundred and fifty one (251) samples of soil taken in 1979 will be processed and counted by alpha spectrometry for plutonium-239 . Two hundred (200) - out of the samples of soil taken in 1966 will be processed and counted in similar way.

### 2.3.- VEGETATION

About 200 samples from crops and wild vegetation will be taken in the period covered by this supplement report .

Ashes from vegetation samples will be counted directly with the "Soil Analysis System" for americium-241, plutonium-239 and uranium-235. We hope to count - about 300 samples in this period. These samples will - belong to those taken in 1978 and 1979.

**DOE ARCHIVES**

About two hundred and twenty (220) samples of the - vegetation taken in 1979 (126) and 1980 (94) will be - processed and counted by alpha spectrometry for plutonium-239.

## 2.4- POPULATION

Three hundred and ninety five (395) individuals out of Palomares population have not been taken to Madrid any time for lung counting , urine excretion analysis, medical examination and cromosomic analysis. 226 out of these persons are older than twelve, one hundred and sixty nine (169) out of them are - younger than twelve.

We try to bring to Madrid as many of these people as they like, because the adult persons in these people have not been recognized yet because they did not want to.

In addition to those people, we will bring to Madrid 60 persons as representatives from different - selected groups. We will try to get urine samples of these 60 persons every quarter of the year. However, difficulties coming from telling those selected people why we want to review them and not to the others, will make us to bring as many persons of his family as they want.

Taking all this into consideration, we can not say now how many persons will be taken to Madrid; they could be about 250 persons.

### **DOE ARCHIVES**

In conversation with Mr. Dean it has been decided to do the calibration studies of our lung counting system with the special phantom designed at LIVERMORE.



## 2.5.- A N I M A L S

We will try to get snail samples from areas 2, 3 and 5 and samples of other wild animals if it is possible to hunt them.

Some sheep and goat grazing for several years - around the zone will be sacrificed and analyzed in - similar way it has been done last year.

We will try to analyse samples from hen and rabbits fed with alfalfa, grain and grass cultivated in the area.

## 3.- EQUIPMENT REQUESTED

The number of samples per year which could be analysed for americium-241 , plutonium-239 and uranium-235 with one "intrinsic germanium detector system" is too small compared with the number of samples we have to. We can analyze up to a average of 6 samples per day because their activities are not too high..

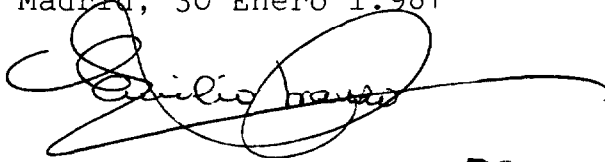
We have 4183 samples of soil and 1117 of ashes from vegetation to be analyzed.

So, it is easy to arrive to the conclusion that we need another "Soil analysis System". If you have problems with your budget for our equipment, I will have no problem if you use for it 30.000 \$ from the budget for the period 1st October 1980 - 30th September 1981 which I mention in the next paragraph.

4 . B U D G E T

We think support from the U.S.A. Government for the Indalo Project during this supplementary period should be 18.000 dollars, that is to say 20 per cent more - than last period. It is possible to use 30.000 dollars out of the total amount for the supply of one more "Soil Analysis System" similar to the one sent last year.

Madrid, 30 Enero 1.981

A handwritten signature in dark ink, appearing to read 'Emilio Iranzo', with a large, sweeping flourish extending to the right.

**DOE ARCHIVES**

Fdo-Emilio Iranzo-